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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/657,379	09/08/2003	Chuan-Cheng Tu	U68.312-0001	9434
164	7590	08/23/2005	EXAMINER	
KINNEY & LANGE, P.A. THE KINNEY & LANGE BUILDING 312 SOUTH THIRD STREET MINNEAPOLIS, MN 55415-1002			PHAM, LONG	
			ART UNIT	PAPER NUMBER
			2814	

DATE MAILED: 08/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

H.A

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/657,379	TU ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Long Pham	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-9, 41-44 and 46-50 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9, 41-44 and 46-50 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_.

## DETAILED ACTION

### Rejections and/or objections necessitated by the amendments

#### *Claim Rejections - 35 USC § 103*

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
2. Claims 1, 2, 3, 4, 5, 6, 7, 8, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito (US 6,583,442) in combination with Shima et al. (US patent 4,532,631) and Sugimoto et al. (JP 04061184).

With respect to claim 1, Ito teaches a light emitting diode (LED), comprising (see figs. 1(a)-1(b), 2, 3, 4, 5(a)-5(b), and 6(a)-6(b) and associated text):

a semiconductor layer 102 of a first polarity;

an active layer 103, located on the semiconductor layer of the first polarity;

and

a semiconductor layer 104 of a second polarity, located on the active layer,

Ito fails to teach that one side of the active layer has a wave-shape border in a top view of the LED.

Shima et al. teach a laser in which a side of the active layer 6 has wave-shape border in a top view. See fig. 1-6 and associated text.

It would have been obvious to one of ordinary skill in the art of making semiconductor devices to incorporate the above teaching of Shima et al. into the device of Ito to obtain excellent characteristic. See col. 4, lines 30-35.

Further with respect to claim 1, since Ito in combination with Shima teaches the claimed device, the probability of reflecting the light emitted from the active layer is reduced, thus the light emitted from the active layer penetrates through the at least one side and emits outside the LED.

With respect to claim 2, Ito further teaches that the semiconductor layer of the first polarity is made of GaN.

With respect to claim 3, Ito further teaches that the active layer is made of InGaN.

With respect to claim 4, Ito further teaches that the semiconductor layer of the second polarity is made of GaN.

With respect to claim 5, Ito further teaches that the shape of the at least one side is selected from a group consisting of semicircle.

With respect to claims 8 and 9, Ito fails to teach forming a valley or trench or groove that extends from an upper surface of the semiconductor of the second polarity through the active layer to the substrate.

Sugimoto et al. teach a light emitting device in which a trench or groove or valley 7 extends from an upper surface of semiconductor layers through the active layer 3 to substrate 1 to improve yield of light efficiency. See the English abstract and figs. 1 and 2.

It would have been obvious to one of ordinary skill in the art of making semiconductor devices to incorporate the above teaching of Sugimoto et al. into Ito's device to improve yield of light efficiency. See the English abstract and figs. 1 and 2.

With respect to claim 6, since Ito in view of Sugimoto et al. teaches the claimed device, a deformed dimension of the at least one side is greater than an equivalent emitting wavelength of the LED.

With respect to claim 7, since Ito in view of Sugimoto et al. teaches the claimed device, an incident angle of the light emitted from the active layer to the at least one side is less than a reflective critical angle of the at least one side.

1. Claims 41, 42, 43, 44, 46, 47, 48, 49, and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito (US 6,583,442) in combination with Shima et al. (US patent 4,532,631) and Sugimoto et al. (JP 04061184).

With respect to claim 41, Ito teaches a light emitting diode (LED), comprising (see figs. 1(a)-1(b), 2, 3, 4, 5(a)-5(b), and 6(a)-6(b) and associated text):

a semiconductor layer 102 of a first polarity;

an active layer 103, located on the semiconductor layer of the first polarity;

and

a semiconductor layer 104 of a second polarity, located on the active layer,

Ito fails to teach that at least one side of at least the active layer and the semiconductor layer of the second polarity has an uneven surface.

Shima et al. teach a laser in which a side of the active layer 6 has uneven surface. See fig. 1-6 and associated text.

It would have been obvious to one of ordinary skill in the art of making semiconductor devices to incorporate the above teaching of Shima et al. into the device of Ito to obtain excellent characteristic. See col. 4, lines 30-35.

Further with respect to claim 41, since Ito in combination with Shima et al. teach the claimed device, the probability of reflecting the light emitted from the active layer is reduced, thus the light emitted from the active layer penetrates through the at least one side and emits outside the LED.

With respect to claim 42, Shima et al. further teach the uneven surface of the at least one side in a top view has a wave-shape border, and the wave-shape border in the top view is semicircular wave-shape border. See fig. 1-6 and associated text.

With respect to claim 48, Ito further teaches that the semiconductor layer of the first polarity is made of GaN.

With respect to claim 49, Ito further teaches that the active layer is made of InGaN.

With respect to claim 50, Ito further teaches that the semiconductor layer of the second polarity is made of GaN.

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With respect to claims 46 and 47, Ito fails to teach forming a valley or trench or groove that extends from an upper surface of the semiconductor of the second polarity through the active layer to the substrate.

Sugimoto et al. teach a light emitting device in which a trench or groove or valley 7 extends from an upper surface of semiconductor layers through the active layer 3 to substrate 1 to improve yield of light efficiency. See the English abstract and figs. 1 and 2.

It would have been obvious to one of ordinary skill in the art of making semiconductor devices to incorporate the above teaching of Sugimoto et al. into Ito's device to improve yield of light efficiency. See the English abstract and figs. 1 and 2.

With respect to claim 43, since Ito in view of Sugimoto et al. teaches the claimed device, a deformed dimension of the at least one side is greater than an equivalent emitting wavelength of the LED.

With respect to claim 44, since Ito in view of Sugimoto et al. teaches the claimed device, an incident angle of the light emitted from the active layer to the at least one side is less than a reflective critical angle of the at least one side.

### ***Response to Arguments***

2. Applicant's arguments with respect to claims 1-9 and 41-44 and 46-50 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Long Pham whose telephone number is 571-272-1714. The examiner can normally be reached on M-F, 7:30AM-3:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on 571-272-1705. The fax

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phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Long Pham  
Primary Examiner  
Art Unit 2814

LP